PROPOSED SCOPE OF WORK DETAILED AIR QUALITY EVALUATION OF TETERBORO AIRPORT TETERBORO, NEW JERSEY

Prepared for:

New Jersey Department of Environmental Protection Trenton, New Jersey

Prepared by:

ENVIRON International Corporation Groton, Massachusetts Newark, New Jersey Princeton, New Jersey

In cooperation with:

Borough of Bogota
Borough of Carlstadt
Borough of East Rutherford
City of Hackensack
Borough of Hasbrouck Heights
Borough of Little Ferry
Borough of Maywood
Borough of Oradell
Borough of Rutherford
Township of South Hackensack
Township of Teaneck
Borough of Wood-Ridge
County of Bergen

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ATTACHMENT

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I. INTRODUCTION AND PREVIOUS WORK

This Scope of Work presents the technical approach that will be used in conducting a detailed air quality study ("Detailed Study") of the vicinity of the Teterboro Airport, located in Teterboro and Moonachie, New Jersey. The purpose of the Detailed Study is to evaluate the potential air quality and health risks associated with operations of the Teterboro Airport.

Teterboro Airport (TEB) is located on an 827-acre property and consists of two runway configurations: Runway 1-19, which is 7,000 feet long with a North/South orientation, and Runway 6-24, which is 6,012 feet long with a NE/SW orientation. The airport is used primarily turboprops and business jets. The airport is bordered by Route 46 to the north, Fred Wehran Drive to the northeast, Redneck Avenue to the southeast, Moonachie Avenue to the south, and Industrial Avenue and Route 17 to the west. The airport is located within the municipalities of Teterboro and Moonachie, and is bordered by Hasbrouck Heights and Wood-Ridge to the west; Moonachie to the south; Little Ferry to the east; and South Hackensack to the north (see Figure 1). Other nearby municipalities include Bogota, Carlstadt, East Rutherford, Hackensack, Maywood, Oradell, Rutherford, and Teaneck, all of which are within the County of Bergen.

In 2001, ENVIRON conducted a screening-level evaluation of potential air quality impacts associated with operations of the Teterboro Airport, which consisted of two parts – a screening-level air sampling and analysis study (conducted over a 48-hour period during June 27-29, 2001) and a preliminary risk evaluation (ENVIRON 2001) ("Screening Study"). The overall results of the Screening Study indicate that airport operations may be affecting ambient air quality in the immediate vicinity. Some of the specific findings of the Screening Study include the following:

- Concentrations of fuel-related compounds such as benzene, toluene, ethylbenzene, xylene, 1,3-butadiene, and trimethylbenzene were measured in air near Teterboro Airport that were higher than annual average levels that have been reported in Camden and Elizabeth, New Jersey by NJDEP. In contrast, concentrations of nonfuel related air toxics such as carbon tetrachloride, chloromethane, and methylene chloride were similar in magnitude at the three sites.
- Concentrations of a number of air toxics were elevated downwind from the airport, compared to background levels measured upwind from the airport. These chemicals include benzene, toluene, ethylbenzene, xylene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and 4-ethyltoluene, all of which are fuel related compounds.

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- At locations in predominantly downwind directions relative to the airport, a greater number of air toxics were detected at higher concentrations downwind from the airport than upwind of the airport.
- A preliminary risk screening was conducted based on the air sampling results. Assuming long-term exposure to the concentrations measured during the study period, risks to human health (both cancer and noncancer health effects) were evaluated. Carcinogenic risks ranging from eight in one hundred thousand (8×10⁻⁵) to nine in ten thousand (9×10⁻⁴) were calculated for an adult receptor using the average air concentration data collected from the airport fenceline. The primary chemicals driving cancer risk are benzene and 1,3-butadiene, which are both fuel-related compounds. Screening-level assessments that indicate cancer risks of greater than approximately one in one million (1×10^{-6}) generally suggest that a more refined analysis may be required. Thus, the preliminary risk results exceed the regulatory benchmark (1×10⁻⁶) by two orders of magnitude, and a more refined analysis is warranted. This assessment also identified noncarcinogenic risks that are up to five times greater than screening levels based on regulatory guidance. The primary chemicals driving noncancer risk are benzene and toluene, which are also fuel-related compounds. Again, such results would suggest that a more refined analysis is warranted.

The Screening Study recognized that the sampling results represented a single point in time and thus may not reflect long-term conditions, and recommended that a more extensive study be conducted.

The specific objectives of the Detailed Study are:

- To assess long-term ambient concentrations of selected air toxics (including chemicals regulated as hazardous air pollutants [HAPs]) in the vicinity of the airport and the associated risks to human health;
- To determine whether contributions from airport emissions can be distinguished from the contributions of other background sources; and
- To assess potential risks to human health for individuals living or working in the vicinity of the airport.

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This work would be conducted in accordance with the General Business Terms and Conditions provided in Attachment A.

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II. PROPOSED TECHNICAL APPROACH

A. Study Objectives

The air monitoring network proposed for the Detailed Study is designed to provide data to meet the following objectives:

- Determine ambient concentrations of specific compounds of potential concern;
- Describe pollutant levels at various locations across the area;
- Provide monitoring results consistent with other data being collected by NJDEP, which would allow for a comparison of the Teterboro area results to data collected for other locations in New Jersey; and
- Determine if the target compound emissions from Teterboro Airport have a measurable impact on air quality and health in the surrounding communities.

To meet the above objectives, the focus of this study was on the compounds known to be emitted by mobile sources (e.g., cars, trucks, and aircraft), with particular attention being placed on those compounds associated with aircraft operations (e.g., takeoff, landing, refueling, and idling).

B. Air Monitoring Network

Several recent evaluations of air quality in the vicinity of airports have been conducted (Barbosa 2000; Eden 2000; ENVIRON 2000a, 2000b; IEPA 2002; McCulley Frick 1995). Based on these studies and other emission inventories (ERG 1999; Hayes 2003), chemicals associated with aircraft operations include various volatile organic compounds (VOCs) (including carbonyls) and particulate matter (including metals). When emitted from aircraft, these and other air toxics will first enter the atmosphere, where they can affect overall air quality. Certain of the air toxics may then deposit onto soil, surface water, vegetation, and other environmental media.

The air monitoring program will consist of two primary sampling sites and two secondary sampling sites (total of four sampling locations). Selection of the four monitoring sites will be based on various factors, including a review of historical meteorological data for Teterboro Airport (e.g., see Figure 2), proximity to the airport operations, and site accessibility. Each of

the two primary locations will be equipped with the following sampling systems or similar systems¹:

- VOC samples will be collected in six-liter stainless steel SUMMA® canisters.
 Carbonyl (e.g., formaldehyde, acetaldehyde) samples will be collected on a Sep-Pak cartridge coated with 2,4-dinitrophenylhydrazine (DNHP). These samples will be collected using an ATEC Model 2200 Toxic Air Sampler, which has the capability of simultaneously collecting air samples into canisters (for VOCs) and sorbent cartridges (for carbonyls).
- Particulate matter samples will be collected using a Rupprecht & Patashnick Partisol-FRM PM-2.5 sampler

The two secondary locations would only be equipped to collect VOC samples, using an ATEC Model 8000 programmable canister sampler.

A meteorological station would also be included at each of the four stations, to collect data related to wind direction and wind speed. The equipment would be housed within a trailer with security fencing. Alternative sampling equipment may be selected based on information obtained during the Monitoring Network Design and Setup phase of this project.

Three types of air sampling events would be included in the Detailed Study:

1. Routine Sampling Events

Calendar day samples (24-hour integrated samples) will be collected on a once every six day schedule for a period of one year. The sampling schedule will coincide with the six-day sampling schedule being utilized by NJDEP for its state-wide monitoring network. Based on this sampling schedule, we will collect a total of 61 samples from each location. There will be 8-9 samples for each day of the week, and 15-16 samples for each season. Evaluating correlations in the changes in average concentrations for days of the week and seasons with corresponding changes in aircraft and motor vehicle traffic patterns will assist in distinguishing between the contributions from these two source groups.

2. Intensive Sampling Events

The routine sampling will be supplemented with periodic intensive sampling events, which will consist of a series of eight three-hour samples collected over a 24-hour period. This will provide temporal data to evaluate differences in concentrations that

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¹ During the first Phase of this project (Monitoring Network Design), ENVIRON may elect to utilize appropriate sampling equipment other than the specific systems listed in this proposal.

may occur over the course of a day. For example, motor vehicle traffic is at its highest during morning and evening rush hours, resulting in a diurnal traffic pattern. Based on the runway use data collected during ENVIRON's 2001 Screening Study, the high usage period for the airport is less cyclical, gradually increasing from the morning, peaking sometime between 2:00 and 6:00 PM, and gradually decreasing during the late evening (see Figure 3). Because of these different traffic patterns, evaluating what temporal trends the air concentration data follow over the course of a 24-hour period would provide added insight as to the source of the measured air toxics.

ENVIRON proposes to conduct quarterly intensive sampling events utilizing specialized instrumentation that can automatically switch sampling media every three hours. This sampling would be conducted at both of the primary sampling locations, where the routine sampling is being conducted.

3. Background Sampling Events

The primary and secondary sampling locations will be close to the perimeter of the airport, in order to evaluate emissions immediately upwind and downwind of the airport. Since the communities surrounding the airport are concerned about the actual exposures that are occurring, ENVIRON proposes to conduct quarterly air sampling at the same time as the intensive sampling events. The samples would be collected using six-liter stainless steel SUMMA® canisters equipped with a flow controller from various locations within the neighboring towns to evaluate representative air quality conditions at each town. Suitable sampling locations would be identified at a residence or business in each area, and located in a backyard or rooftop in order to minimize contributions from local traffic

ENVIRON will request NJDEP's assistance in obtaining information from Teterboro Airport or Port Authority of New York and New Jersey (PANYNJ) that will be crucial to the data analysis, such as hourly landing and take-off (LTO) data.

C. Laboratory Methods and Quality Assurance

This Detailed Study will utilize several sampling and analytical methods developed by the United States Environmental Protection Agency (USEPA) to evaluate the presence of VOCs, aldehydes, and particulate matter in ambient air, as described below.

1. Volatile Organic Compounds

Equipment to be used to collect all air samples for VOCs will follow USEPA guidelines outlined in *Compendium Method TO-15: Determination of Volatile Organic*

Compounds (VOCs) in Air Collected In Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). Integrated samples will be collected in six-liter stainless steel SUMMA® canisters, which will be cleaned, individually certified, and evacuated by the analytical laboratory in accordance with Method TO-15. Using flow controllers, ambient air was pumped into the canisters at a constant flow rate over the duration of the sampling period. These whole air samples will be subsequently analyzed for target VOCs by GC/MS.

In addition to these chemicals, Pleil et al. (2000) noted that jet fuel tends to have higher concentrations of n-alkanes in the C_9 to C_{12} range than automotive fuel. Thus, these higher level alkanes may serve as indicator species of airport influences. The list of VOCs may therefore be expanded to include butane, pentane, octane, nonane, decane, undecane, and dodecane.

2. Carbonyls

Carbonyls (e.g., formaldehyde, acetaldehyde)will be sampled in accordance with Compendium Method TO-11A: Determination of Formaldehyde in Ambient Air Using Adsorbent Cartridge Followed by High Performance Liquid Chromatography (HPLC). Air samples will be pumped through a Sep-Pak cartridge coated with DNHP.

3. Fine Particulate Matter and Metals

Total PM2.5 mass and metal concentrations will be sampled in accordance with Federal Reference Method RFPS-0498-118, a designated reference method for measuring PM2.5. The filter samples will be analyzed for concentrations of eight metals (antimony, arsenic, beryllium, cadmium, chromium, lead, manganese, and nickel) by atomic absorption spectroscopy (AAS) or x-ray fluorescence (XRF).

Quality assurance activities will include flow audits, trip blanks, duplicate sampling for precision (metals, carbonyls, VOCs), and independent performance audits (blind samples for metals, VOCs, and carbonyls). A separate Quality Assurance Plan will be developed for use with this network.

D. Risk Evaluation

A risk screening evaluation will conducted based on the average air sampling results for each sampling location. Assuming long-term exposure to the concentrations measured during the study period, risks to human health (both cancer and noncancer health effects) via the inhalation pathway will evaluated, in accordance with NJDEP risk screening procedures. Limited dispersion modeling may also be conducted, if appropriate.

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IV. REFERENCES

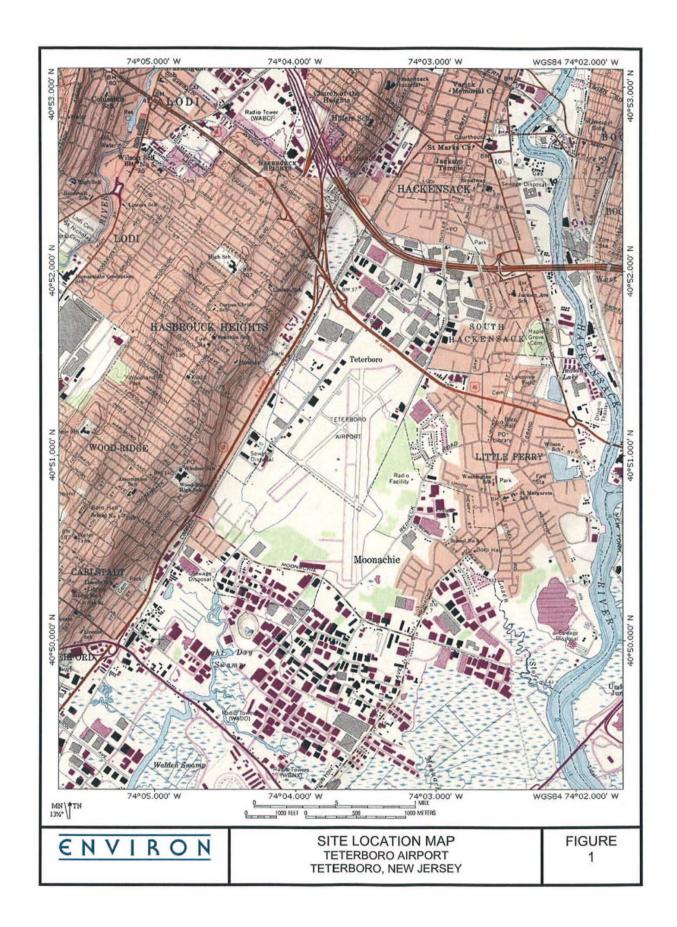
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FIGURES



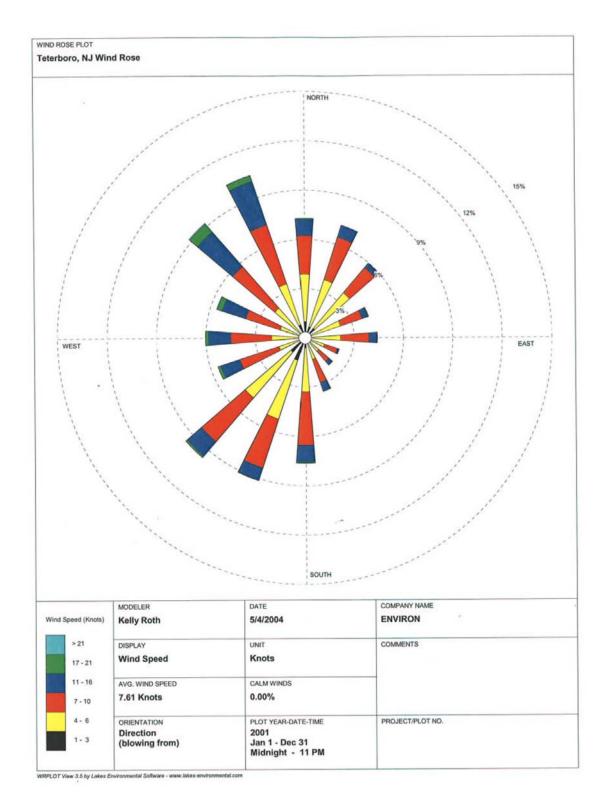


Figure 2. Wind rose diagram for Teterboro Airport, 2001. Predominant winds blow from the northwest and southwest

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Landing and Takeoff Data Teterboro Airport, June 25-29, 2001

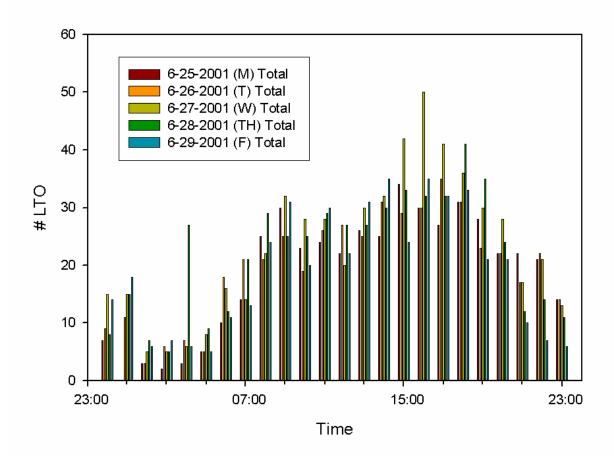


Figure 3. Number of Landings and Takeoffs (LTO), Teterboro Airport, June 25-29, 2001. LTOs increase steadily from early morning, peaking between 2:00 and 6:00 PM, and gradually decreasing by late evening.

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ATTACHMENT A

General Business Terms and Conditions

GENERAL TERMS AND CONDITIONS

ENVIRON International Corporation, a Virginia corporation, ("ENVIRON") agrees to provide professional services under the following General Terms and Conditions:

- 1. <u>Fees:</u> ENVIRON bills for its services on a time and materials basis using standard hourly rates. If requested, we will provide an estimate of the fees for a particular task, and we will not exceed that estimate without prior Client approval. For deposition and testimony we charge premium hourly rates. In certain circumstances we will undertake an assignment on a fixed fee basis if the requirements can be clearly defined.
- **2.** <u>Invoicing</u>: ENVIRON bills its clients on a monthly basis using a standard invoice format. This format provides for a description of work performed and a summary of professional fees, expenses, and communication and reproduction charges. For more detailed invoicing requests, ENVIRON reserves the right to charge for invoice preparation time by staff members.
- **3.** <u>Payment</u>: ENVIRON bills are payable UPON RECEIPT. We reserve the right to assess a late charge of 1.5 percent per month for any amounts not paid within 30 days of the billing date. We also reserve the right to stop work or withhold work product if invoices remain unpaid for more than 60 days past the billing date. If our work relates to a business transaction, we expect to be paid in a timely fashion, without regard to whether or when the transaction closes. If we are required to take legal action to have our invoices paid and we win in court, Client agrees to pay our costs, including reasonable legal fees.
- **4.** Reimbursable Expenses: The cost of project-related communications, to include in-house telephone, facsimile, postage, and reproduction, will be charged at 3 percent of the total labor charges. Project-related expenses including travel, priority mail, overnight delivery, outside reproduction and courier services will be billed at cost plus up to 15 percent. The use of company-owned and rental cars, trucks, and vans will be charged at \$75 per day. These charges include all associated costs such as gasoline, insurance, and maintenance. Any equipment purchased as part of this project will remain the property of ENVIRON. The cost of project-related computer use will be charged at 3 percent of total labor charges by technical staff to include word processing, data compilation by spreadsheet, and CADD. For specialized computer applications requiring integrated computations, such as large air dispersion modeling runs, a premium will be charged, based on the requirements of the particular project. Use of other company-owned equipment and protective clothing will be billed in accordance with our standard fee schedule.
- **5.** Access and Information: Client agrees to grant or obtain for ENVIRON reasonable access to any sites to be investigated as part of ENVIRON's scope of work. Client also agrees to indicate to ENVIRON the boundary lines of the site and the location of any underground structures, including tanks, piping, water, telephone, electric, gas, sewer, and other utility lines. Client agrees to notify ENVIRON of any hazardous site conditions or hazardous materials, about which Client has knowledge and to which ENVIRON's employees or contractors may be exposed while performing

services on behalf of Client, including providing copies of relevant Material Safety Data Sheets. Client also shall make available to ENVIRON all information within its control necessary to allow ENVIRON to perform its services and agrees to comply with reasonable requests by ENVIRON for clarification or additional information. Client shall be responsible for the accuracy of this information. ENVIRON shall not be responsible for any damage to underground structures or utilities to the extent such damage was caused by incomplete or inaccurate information provided to us by the client or other party. Client agrees to make ENVIRON aware of any unsafe conditions at any project site about which Client has knowledge.

- **6.** Reporting Requirements: Client may be required under federal, state or local statutes or regulations to report the results of ENVIRON's services to appropriate regulatory agencies. ENVIRON is not responsible for advising Client about its reporting obligations and Client agrees that it shall be responsible for all reporting, unless ENVIRON has an independent duty to report under applicable law. In those situations, ENVIRON will provide Client with advance notice that ENVIRON believes that it has an obligation to report as well as the substance of the report it intends to make.
- 7. RCRA Compliance: Client shall be responsible for complying with the Resource Conservation and Recovery Act, 42 U.S.C. Section 6901 et. seq. ("RCRA") and its implementing regulations in connection with ENVIRON's work under this Agreement. Client may request ENVIRON's assistance in meeting its RCRA and other similar waste management obligations, including analytical testing to assist Client in proper characterization of waste, identifying potential transporters and disposal facilities for waste (provided that Client shall make the final selection of both the transporter and disposal facility), entering into subcontracts or purchase order arrangements with the transporters and/or disposal facilities selected by Client, and preparing manifests for the Client's approval and execution. Client agrees that, by virtue of providing these services, ENVIRON shall not be deemed a "generator" or a party who "arranges" for the "transportation," "treatment" or "disposal" of any "hazardous waste" or "hazardous substance" (as those terms are defined in the Comprehensive Environmental Response Compensation and Liability Act or "CERCLA", 42 U.S.C. Section 9601). Client agrees to indemnify, defend and hold ENVIRON, its directors, officers, employees and agents, harmless from and against any and all claims, demands, judgments, obligations, liabilities, any costs (including reasonable attorneys' and expert fees) relating to: (1) ENVIRON'S work in assisting Client with its RCRA obligations; and (2) the transportation, treatment, and disposal of hazardous substances or hazardous waste generated by the field activities conducted for Client.
- **8.** <u>Subcontractors</u>: ENVIRON has a policy that its Clients should directly retain other contractors whose services are required in connection with field services for a project (<u>e.g.</u>, drillers, analytical laboratories, transporters). As a service to you, we will advise you with respect to selecting other such contractors and will assist you in coordinating and monitoring their performance. In no event will we assume any liability or responsibility for the work performed by other contractors you may hire. When ENVIRON engages a subcontractor on behalf of the Client, the expenses incurred, including rental of special equipment necessary for the work, will be billed as they are incurred, at cost plus up to 15 percent. By engaging us to perform these services, you agree to indemnify, defend and hold ENVIRON, its directors, officers, employees, and other agents harmless from and against any claims, demands, judgment, obligations, liabilities and costs (including reasonable

attorneys' and expert fees) relating in any way to the performance or non-performance of work by another contractor, except claims for personal injury or property damage to the extent caused by the negligence or willful misconduct of ENVIRON's employees.

- **9.** ENVIRON's Proprietary Models Fees: The use of ENVIRON's proprietary, computer-based risk assessment model, ERMAsm, will be billed as follows: \$300 for access to ERMAsm, including one exposure scenario and up to five chemicals; \$100 per chemical in excess of initial five; and \$200 per additional scenario. ENVIRON's proprietary, computer-based ground water flow model, EFAMtm, will be billed at \$300 for access. Use of ENVIRON's toxicity, chemistry, and regulatory data base, CHEMBASEsm, will be billed at the rate of \$50 per chemical.
- **10.** Confidentiality: We treat all information obtained from Clients, not otherwise previously known to us as confidential, unless such information comes into the public domain through no fault of ours, or is furnished to us by a third party who is under no obligation to keep the information confidential. If we are subpoenaed to disclose confidential information obtained from you or about our work for you, we will give you reasonable notice and the opportunity to object before releasing any confidential information.
- 11. <u>Independent Contractor</u>: Client agrees that ENVIRON is acting as an independent contractor and shall retain responsibility for and control over the means for performing its services. Nothing in these Terms and Conditions shall be construed to make ENVIRON or any of its officers, employees or agents, an employee or agent of Client.
- 12. Standard of Care: In performing services, we agree to exercise professional judgment, made on the basis of the information available to us, and to use the same degree of care and skill ordinarily exercised in similar circumstances by reputable consultants performing comparable services in the same geographic area. This standard of care shall be judged as of the time the services are rendered, and not according to later standards. ENVIRON makes no other warranty or representation, either express or implied, with respect to its services. Estimates of cost, recommendations and opinions are made on the basis of our experience and professional judgment; they are not guarantees. Reasonable people may disagree on matters involving professional judgment and, accordingly, a difference of opinion on a question of professional judgment shall not excuse a Client from paying for services rendered.

Client recognizes that there may be hazardous conditions at sites to be investigated as part of ENVIRON's work. Client acknowledges that ENVIRON has neither created nor contributed to the existence of any hazardous, toxic or otherwise dangerous substance or condition at the site(s) which are covered by ENVIRON's work. Client also recognizes that some investigative procedures may carry the risk of release or dispersal of pre-existing contamination, even when exercising due care. Client releases ENVIRON from any claim (including claims under CERCLA or state law) that it is an "operator" of any site where it performs work for Client or a "generator" or a party who "arranges" for the "transportation," "treatment" or "disposal" of any "hazardous substance" (as those terms are defined in CERCLA), by virtue of its work for Client at any site.

13. <u>Insurance</u>: ENVIRON shall maintain the following insurance coverage while it performs the work described in Exhibit "A:" (1) statutory Workers Compensation and Employer's Liability

Coverage; (2) General Liability for bodily injury and property damage of \$1,000,000 aggregate; (3) Automobile Liability with \$1,000,000 combined single limit; and (4) Professional Liability and Contractor's Pollution Liability with a combined single limit of \$2,000,000 per claim and in the aggregate. If Client desires additional insurance or special endorsements, premiums associated with that coverage will be considered a reimbursable expense. Upon request, we will provide you with a certificate of insurance.

- 14. Third Parties: ENVIRON's services are solely for Client's benefit and may not be relied upon by any third party without ENVIRON's express written consent. Any use or dissemination of ENVIRON work products (including ENVIRON reports), without the written consent of ENVIRON, shall be at Client's risk and Client shall indemnify and defend ENVIRON from any and all claims, demands, judgment, liabilities and costs (including reasonable attorneys' and expert fees), related to the unauthorized use or dissemination of ENVIRON's work. Client also agrees to be solely responsible for and to defend, indemnify, and hold ENVIRON harmless from and against any and all claims, demands, judgments, liabilities and costs (including reasonable attorneys' and expert fees), asserted by third parties arising out of or in any way related to our performance or non-performance of services, except for claims of personal injury or property damage to the extent caused by the negligence or willful misconduct of ENVIRON's employees.
- 15. <u>Limitation of Liability</u>: ENVIRON shall be liable only for direct damages that result from ENVIRON's negligence or willful misconduct in the performance of its services. UNDER NO CIRCUMSTANCES SHALL ENVIRON BE LIABLE FOR INDIRECT, CONSEQUENTIAL, SPECIAL, OR PUNITIVE DAMAGES, OR FOR DAMAGES CAUSED BY THE CLIENT'S FAILURE TO PERFORM ITS OBLIGATIONS UNDER LAW OR CONTRACT. ENVIRON shall not be liable for and Client shall indemnify ENVIRON from and against all claims, demands, liabilities and costs (including attorneys' and expert fees) resulting from on-site activities except to the extent caused by ENVIRON's negligence or willful misconduct. In no event shall our liability exceed the amount paid to us by you for our professional services (net of reimbursable expenses) and Client specifically releases ENVIRON for any damages, claims, liabilities and costs in excess of that amount.
- **16.** <u>Termination</u>: This Agreement may be terminated by either party upon ten (10) days written notice to the other. If Client terminates the Agreement, Client agrees to pay ENVIRON for all services performed until the effective date of the termination. Client's obligations under Paragraphs 7, 8, 10, 12, 14 and 15 shall survive termination of this Agreement and/or completion of the services hereunder.
- 17. <u>Disputes</u>: All disputes under this Agreement shall be resolved by binding arbitration under the rules of the American Arbitration Association. If our personnel or documents are subpoenaed for depositions or court appearance in any dispute related to the project (except disputes between ENVIRON and Client related to our services), Client agrees to reimburse us at our then current billing rates for responding to those subpoenas, including out-of-pocket reimbursable expenses.
- **18.** <u>Scope of Agreement</u>: Once Client has signed ENVIRON's proposal, that proposal and these Terms and Conditions shall constitute the complete and exclusive Agreement between the parties and will supersede all prior or contemporaneous agreements, whether written or oral. No provision

of these Terms and Conditions may be waived, altered or modified except in writing and signed by ENVIRON. Client may use standard business forms, such as purchase orders, for convenience only; any provision on those forms that conflict with these Terms and Conditions shall not apply.

May 2004